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Ecology of White-Nosed Coatis in the Huachuca Mountains, Arizona

- A Preliminary Study -

Submitted to:

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Table of Contents

Abstract

A 16-month preliminary study of white-nosed coatis (*Nasua narica*) was undertaken to quantify basic aspects of their ecology near the northern extent of their range. The study took place in the Huachuca Mountains of southeastern Arizona, with most field work occurring in the mountainous portions of Fort Huachuca Military Reservation. Fifty-nine coatis were captured and marked; 28 of these were fitted with radio-collars. Radio-collared animals included 11 males and 17 females belonging to eight different troops, or social groups. The mating season extended from mid-March to the end of April. Births occurred during late June, with females bringing an average of 3.9 young back to the troops. Four parturition denning areas were located; all were in rock outcrops. Mortality rates were high among marked animals, with only 39% of adult males, and 73% of adult females surviving the study. The major cause of death was predation by mountain lions. Bear predation, disease, and accidents were also mortality factors. The population of coatis within the study area was estimated at about 155 animals, with a density of approximately 1.7 coatis per km^2. Troop size averaged 12.2 animals. Maximum troop sizes occurred during November-December, with some troops combining to form temporary aggregates of almost 50 animals. Troops were generally cohesive, but some movements of females from one troop to another were documented. Home ranges averaged 8.7 km^2 for males (range 4.6 to 11.7 km^2), and 16.6 km^2 for troops (range 9.1 to 26.8 km^2). Male home ranges overlapped by as much as 83%, troop home ranges overlapped up to 93%, and males overlapped troops up to 93%. Coatis were most frequently located in woodland habitats, specifically oak woodland and riparian deciduous forest. Diet was composed mostly of fruits and invertebrates, with vertebrates in <5% of scats. Alligator juniper berries and coleopterans comprised the greatest number of fruits and invertebrates, respectively. Some fruits and invertebrates were available to the coatis year-round, with a rise in food abundance during July-September. Riparian habitats had the highest abundance of fruits and invertebrates, compared to other habitats.

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Chapter 1

1 Introduction

1.1 Background

The Huachuca Mountains of southeastern Arizona are host to a large guild of medium sized carnivores that includes procyonids, mustelids, canids, and felids. Of these species, white-nosed coatis (Procyonidae: *Nasua narica* Linneaus, 1766; taxonomy follows Decker, 1991; Gompper, 1995) are one of the most interesting due to their social and diurnal nature. Yet, in spite of their visible habits, they remain relatively unstudied in the United States and Mexico.

White-nosed coatis inhabit woodland, grassland and desert scrub from Panama north to southeastern Arizona, southwestern New Mexico, and Texas along the Rio Grande (Taylor, 1934; Kaufmann et al., 1976). They appear to be recent immigrants to the United States, with the first documentation from Fort Huachuca during 1892 (Wallmo and Gallizioli, 1954). By the 1920's and 1930's, they were observed frequently in many of the "sky islands" (Taber, 1940; Wallmo, 1951; Hoffmeister and Goodpastor, 1954; Wallmo and Gallizioli, 1954; Hoffmeister, 1956; Pratt, 1962).

Coatis have been most studied on Barro Colorado Island in Panama. There, habituated groups of coatis have yielded data on group structure, social behavior, home range, relatedness of troop members, food habits, and reproduction (Kaufmann, 1962; Smythe, 1970; Russell, 1981, 1982, 1983; Gompper & Krinsley, 1992; Gompper, 1994, 1997; Wright et al., 1994; Gompper and Wayne, 1996; Gompper et al., 1997).

Studies in Arizona have been more restricted. Risser (1963) attempted a study of coatis during 1960-1962, but was hindered by low population numbers following a die-off attributed to distemper. Gilbert (1973) observed a group of coatis at Coronado National Monument for 6 months and described his experiences in the popular account, *Chulo*. Lanning (1975, 1976) compiled observation records and radio-tracked several males for 6 months at Chiricahua National Monument. Kaufmann et al. (1976) reviewed the status and distribution of coatis in the United States. Ratneyeke et al. (1994) described the home ranges of several female coatis before and after they gave birth. Several other accounts provide limited, often questionable, accounts of coati movements, food habits, predators, and density in Arizona (Taber, 1940, Healy, 1952; Wallmo and Gallizioli, 1954: Pratt, 1962).

1.2 Management History of Coatis in Arizona

First listed as a component of United States fauna during 1934 (Taylor, 1934), coatis in Arizona were protected from harvest until 1947. Removal of protection for coatis followed complaints by mountain residents of coati depredation on orchards and poultry (Wallmo and Gallizioli, 1954; F. Thomas, pers. comm). The following was gleaned from Arizona Game & Fish Department hunting proclamations, 1929-1997 (AGFD, 1929-1997). Coatis were classified as furbearers with unlimited harvest from 1 November 1948-1 March 1949. During 1949, the season on furbearers became year-round, with unlimited take. During the late 1950's, hunters were encouraged to kill coatis because they were blamed for destroying the nests of Turkey (*Meleagris gallopavo*) and Mearns' Quail (*Cyrtonyx montezumae*; Healy, 1952; Pratt, 1962; T. Beattie, pers. comm), and because they occasionally injured dogs used to hunt mountain lions (J. Pratt, pers. comm.). Until 1969, an unlimited number of coatis could be harvested year-round, using any legal method of take. During the 1969-1970 season, firearms could not be used for taking any furbearer during open pronghorn and elk hunts, and during February javelina hunts. From 1970-1973, the furbearer season was limited to 1 October-31 March. Beginning in 1974-1975, furbearers could again be taken year-round. During 1978-1979, take of furbearers with traps was limited to 1 November-28 February, but take with firearms was open year-round. During 1980-1981, coatis were reclassified as non-game mammals, and take with leghold traps was prohibited. Coatis continued to be classified as non-game animals from 1981 to 1986, with unlimited take and a year-round season.

Beginning in 1986-1987, coatis were listed specifically in the hunting regulations under "Predatory, fur-bearing, and other mammals." The season was limited to 1 August-31 March except in areas with elk, general javelina, or spring turkey hunts in progress. Harvest was unlimited. During 1988-1989, the season on coatis decreased to 1 September-31 March, and a limit of one animal per calendar year was imposed. These regulations remain in effect to date.

1.3 Objectives

The objectives of this study were to fill in some of the gaps regarding coati ecology at the northern extent of their range. Specifically:

1) To capture and radio-collar a number of coatis to determine movement patterns, home range size and shape, habitat use, and social dynamics.

2) To compare reproduction of coatis in Arizona to published data from Panama, in particular the timing and duration of reproductive seasons, age at first reproduction, and offspring production.

3) To collect data on mortality factors and incidence of disease.

4) To examine food habits, and compare with other studies.

5) To collect data on seasonal availability of the coatis primary foods, fruits and invertebrates, and relate this to other aspects of coati ecology.

Chapter 2

2 Methods

2.1 Study Area

2.1.1 Location

The study was conducted in the Huachuca Mountains in southern Arizona. The study area encompassed much of the northeastern half of the Huachuca Mountains, and included lands managed by the Fort Huachuca Military Reservation, the Sierra Vista District of the Coronado National Forest, and Ramsey Canyon Nature Conservancy Preserve (Fig. 2.1). The intent at the onset of the study was to focus on coatis in Garden and Huachuca Canyons on Fort Huachuca and in Ramsey Canyon. However, coatis did not restrict their movements to these areas and the study area was enlarged to accommodate.

2.1.2 Physiography

The Huachuca Range extends northwest and southeast, over 40 km in length and 6.5 km in width. Elevations range from 1400 to almost 3000 m. The range is composed of a single ridge, dissected by deep canyons along its length. Substrate is sedimentary with metamorphic and igneous coverings; canyons open onto alluvial fans. Although the area is heavily wooded along canyon bottoms and hillsides above 1700 m, bare outcrops composed of limestone or conglomerate are common.

2.1.3 Climate

Climate within the study area is semi-arid, with average minimum temperatures of 2.5°C during January and average maximum temperatures of 33°C during June. Rainfall averages almost 400 mm, with almost half of that falling during July and August (Fig. 2.2).

Weather data were obtained from the Central Meteorological Office at Fort Huachuca, located near Libby Army Airfield (1430 m elevation, 1974-1995). For the purposes of the study, weather data were analyzed two ways. Climatic seasons were based on temperature and precipitation and included winter, spring, summer, and fall. Biological seasons took into account the reproductive patterns of male and female coatis and were divided as follows: for males; winter, mating; spring; summer, and fall; for females, winter, mating, gestation, denning, summer, and fall (Table 2.1).

2.1.4 Flora

Vegetation in the study area was primarily woodland, with chaparral and grassland associations at lower elevations. Formation types included (dominant genera in parenthesis, classification according to Brown, Lowe and Pase, 1979): Madrean subalpine and montane conifer forest (*Pseudotsuga, Pinus, Abies, Populus, Quercus*), Madrean evergreen forest and oak-pine woodland (*Quercus, Pinus, Juniperus*), interior chaparral

(*Arctostaphyllos, Ceanothus, Cercocarpus, Garrya*), interior southwestern riparian deciduous forest and woodland (*Populus, Platanus, Fraxinus, Juglans, Acer*), and cold and warm temperate grasslands (*Bouteloua, Aristida, Hilaria, Sporobolus, Yucca, Acacia*).

2.2 Capturing and Marking

Live-traps (Tomahawk model 207) were set along canyon bottoms, and operated for 5-20 days per month during the entire study. Elevations of trapping areas ranged from 1400 to 1850 m. Traps were placed in the shade to reduce thermal stress and protect from precipitation. Traps were baited with a variety of food items, including sardines, canned cat food, dry cat food, dry dog food, bananas, marshmallows, cantaloupe, peanut butter, and assorted carnivore lures. Finally a mixture of peanut butter and dry cat food was used that was inexpensive and effective at catching coatis.

Traps were left open day and night, usually for 4 days at a time, and checked daily between 0730 and 1130 h, and between 1600 and 1800 h. For calculation purposes, each 24-h period was considered a "trap-day." When a coati was captured, it was weighed in the trap, and immobilized with a 5:1 mixture of ketamine hydrochloride and xylazine hydrochloride at 22 mg/kg (Seal and Kreeger, 1987). Once animals were sedated, they were removed from the traps, weighed again, and standard morphometrics were taken. Three to five cc of blood were withdrawn via jugular venipuncture. An aluminum eartag (National Band & Tag Co.) and/or a plastic rototag (Nasco Farm & Ranch) were attached to the ears. Some adult animals were marked with 2 cm color-coded nylon collars (dog collars), and others were fitted with radio-collars (105-115 g; Advanced Telemetry Systems, Inc.). Radio-collars were equipped with mortality sensors. Animals were checked for external parasites. Unusual scars, marks, or coloration were noted, as were tooth eruption and wear, and the size and condition of mammary glands or scrotum. Following handling, which usually took 20-40 min, the animal was returned to the trap and the trap was returned to its sheltered location. To avoid excessive excitement upon recovery, traps were set so the coati could let itself out of the trap when it was sufficiently coordinated to force open the door, which was not locked but held closed by a small stick. Trapping and handling protocols were designed to minimize stress to captured animals (*ad hoc* Committee for Acceptable Field Methods in Mammalogy, 1987).

2.3 Radio-tracking Coatis

Attempts were made to locate radio-collared coatis at least two times per week. If coatis could be approached with minimal disturbance, than an attempt was made to determine group size and activity. An altimeter and bearings to landmarks were used to plot UTM coordinates to the nearest 10 m. When coatis could not be approached without disturbing them, a location was estimated by triangulating two or more bearings to the signal or using signal strength in conjunction with observed topography to estimate the location of the signal. Error associated with estimated locations was determined by placing 16 test collars in three different mountainous habitats on Fort Huachuca, estimating the location and recovering the collar. The locations of three more collars were estimated while recovering mortalities. Error was calculated as the distance between estimated and actual location (Zimmerman and Powell, 1995).

All locations were plotted on USGS 7.5-min topographic maps. A global positioning unit was found to be of limited value in the deep canyons of the Huachucas, where too few satellites could be reached consistently to attain an accurate location. When possible, locations were estimated for individual coatis every 60-120 minutes. These data were used to estimate rates of movement. Data taken at close intervals may be serially autocorrelated, and result in the underestimation of home range size (Swihart and Slade, 1985). Rates of movement data were used to determine the amount of time it would take a coati to move across its home range (White and Garrott, 1990).

2.4 Reproduction

Reproductive seasons were determined from observed behaviors and hormonal profiles. Changes in group composition, e.g., males associating with troops, females isolating themselves during the parturition season, and first appearance of young-of-the year, were recorded. Reproductive seasons were compared to plasma profiles of estradiol, progesterone, and testosterone (Bronson, 1989; Davison, 1993). Blood samples collected during trapping operations were collected into Vacutainers® with EDTA, and placed on ice. Samples were centrifuged and the plasma separated into three aliquots, with one used for hormone analysis and the other two for disease surveys (see below). Reproductive steroids were determined using radioimmunoassay at the Department of Biology, University of North Dakota.

Attempts were made to locate each radio-collared female's parturition den to determine den location and substrate (tree, cave, etc.). Females were monitored closely to determine when they first brought their kits down from the den, which occurs approximately 5 weeks postpartum (Kaufmann, 1962).

2.5 Mortality and Disease

Radio-collars were equipped with mortality sensors to help ascertain the time and cause of death. When mortalities were discovered, detailed notes and photographs of the area were taken. Whole carcasses were examined for signs of predation; if none was found the carcass was submitted to either Fort Huachuca Veterinary Services or University of Arizona Veterinary Diagnostic Laboratory for necropsy. If predation was indicated, likely predators were assigned based on recovered remains (O'Gara, 1978; Wade and Bowns, 1981; Shaw, 1987). Mortality rates were calculated using the Kaplan-Meier method with staggered entry design (Pollock et al., 1989). All adults that were observed for at least 4 months were included in analyses. Time of death was recorded from February 1996, the first month that animals were radio-collared. Time of censoring was the last date of observation, or 30 April 1997 if known to still be alive at the end of the study.

Coatis are subject to both rabies and canine distemper virus (Kaufmann et al., 1976; Kaufmann, 1987; Risser, 1963). Plasma samples were sent to the Centers for Disease Control in Atlanta to detect virus antibodies for rabies (Smith, 1995), and to the UA Veterinary Diagnostic Laboratory to detect antibodies for canine distemper virus. Because both of these diseases may be highly contagious, blood samples also were taken from other carnivores trapped during routine trapping. Samples of brain tissue from road kills and recovered mortalities also were submitted for rabies testing.

2.6 Home Range

Size of home range was calculated using a fixed kernel density estimator (Worton, 1995; Seaman and Powell, 1996), and the minimum convex polygon for comparisons to other studies (e.g., Ratneyeke et al., 1994; Gompper, 1997). Following convention in defining home range as that area normally covered by an animal (Burt 1943); the outer 5% of locations were removed from analyses (White and Garrott, 1990). Both estimators were calculated using Ranges V software (Kenward and Hodder, 1996). The default smoothing factor from Ranges V, calculated as the standard deviation divided by the sixth root of N, where N is the number of locations (Kenward and Hodder, 1996), was used instead of least-squares cross-validation (Seaman and Powell, 1996), because the latter removed too much area between isolated locations. Coatis often foraged continuously as they moved between locations; I believe that much of the habitat between locations is available to coatis and should be included as part of their home range.

Coatis live in troops composed of related females and their offspring (Kaufmann, 1962; Russell, 1983; Gompper, 1994). Adult males usually are solitary outside of the mating season. Females within troops often do not act independently, but rather in concert with the troop. Therefore, home ranges were calculated for individual males, and for troops as a unit, except during late gestation and early lactation when females were solitary.

2.7 Habitat Use

Habitat use was determined at independent locations of individual males and troops. Two different vegetation layers were used for analyses. A vegetation layer derived from Arizona GAP analysis contained coverage for the entire study area, but was very coarse. The vegetation layer from the Fort Huachuca vegetation model was finer grained, but developed using a different classification scheme, and coverage did not extend outside the Fort boundary. Elevation and aspect data came from USGS topographic maps. These layers were used to determine vegetation type, aspect, and elevation at each location. The Fort Huachuca vegetation layer was imported into Ranges V for analyses. GAP vegetation type, aspect, and elevation were determined at each location by the Advanced Resources Technology Group at the University of Arizona, and summarized using statistical software.

2.8 Food Habits

Food habits were quantified from analyses of scat samples. Scats were collected only from trapped animals and while following coatis, because of the similarity of coati and gray fox (*Urocyon cinereoargenteus*) scats. Scats were placed into plastic bags and frozen. Before analyses, scats were autoclaved and washed through sieves to separate components by size. Components were classified to the lowest taxa possible, which usually was species for fruits, genera for mammals and reptiles, and order for birds and invertebrates. Material in scats was compared with published descriptions of hair (Nason, 1948; Mayer, 1952; Day, 1966, Moore et al., 1974) and bones (Olsen, 1968). A reference collection was established that included representative invertebrates, fruits, feathers, bone, and mammal hair. In addition, a guide to the hair of mammals of southeastern Arizona was created using photomicrographs of medullary patterns and scanning electron micrographs of cuticular patterns collected by H.E. Graham of Northern Arizona University. M. Tuegel, AGFD, verified invertebrate identifications. Data recorded with each scat included date collected, age and sex of the animal if known, and general location. Importance was calculated as percent occurrence (Litvaitis et al., 1994).

2.9 Food Availability

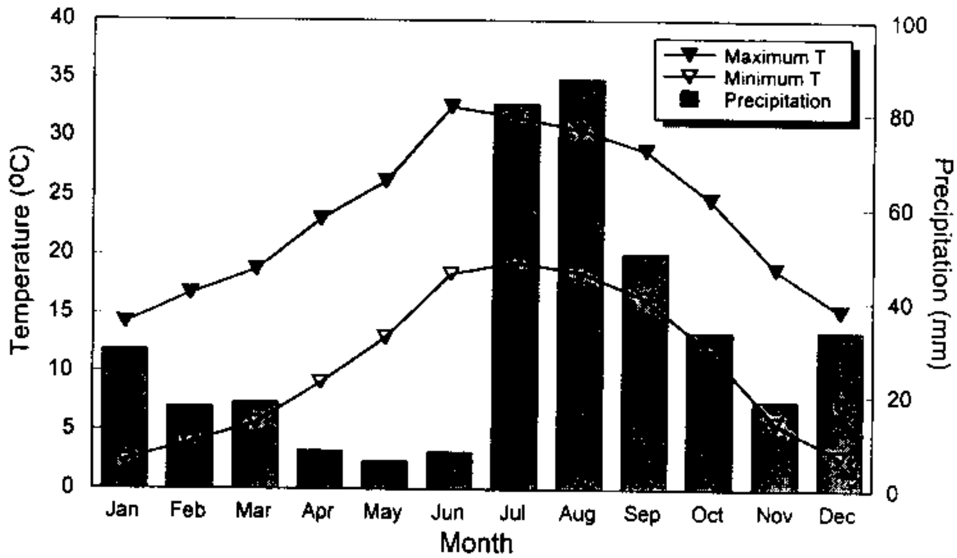
To determine if patterns of food availability might affect coati reproduction or movements, the relative abundance of fruits and invertebrates were examined. Four transects, established by U.S. Army Land Condition-Trend Analysis personnel at Fort Huachuca, were chosen that comprised four different habitat types: riparian forest, chaparral, encinal, and oak-pine woodland. All transects were between 1500-2000 m in altitude, and coati sign was observed at each transect at some time during the 12 months of monitoring (March 1996-February 1997). Each transect was 100 m long, divided into four quadrats of

25 m. One 25-m quadrat from each transect was used for both fruit phenology and invertebrate abundance. To assess fruit phenology, all shrubs and trees within 5 m of the center line of the quadrat were examined and classified into one or more phenological stages: non-reproductive, flower buds, flowers, immature fruit, ripe fruit, fruit-on-ground, and last-year's fruit. To assess invertebrate abundance, all invertebrates > 2 mm in length were counted within the top 10 cm of leaf litter along a 10 m long, 60 cm wide strip. Ants moving within the litter were counted; ant nests were not. Invertebrates were identified to order. All transects were sampled biweekly.

2.10 Statistical Analysis

Because this was a preliminary study, statistical tests were limited to comparisons between males and females, and tests of food abundance by plot and season. All tests were two-tailed, with the significance level set at $P<0.05$.

• Figure 2.1. Average temperatures and precipitation at the Central Meteorological Office, Fort Huachuca, 1974-1995.



• Table 2.1. Definitions of seasons used in this study.

	Climatic Seasons	Biological Seasons: Males	Biological Seasons: Females
Winter	1 January-31 March	1 January-15 March	1 January-15 March
Spring	1 April-30 June	1 May-30 June	
Summer	1 July-30 September	1 July-30 September	1 August-30 September
Fall	1 October-31 December	1 October-31 December	1 October-31 December
Mating		16 March-30 April	16 March-30 April
Gestation			1 May-25 June
Denning			26 June-31 July

Chapter 3

3 Population Dynamics

3.1 Results

3.1.1 Trapping Success

Trapping success varied widely from month-to-month throughout the study (Fig. 3.1) and depended primarily on the trap type (no coatis were caught in Hav-a-hart raccoon traps) and if the coatis happened to be in the particular area being trapped. From January 1996 through April 1997, 59 coatis were captured 104 times during 1586 trap-days. This included 25 males (15 adults, and 10 kits) and 34 females (30 adults, 1 yearling, and 3 kits). Males were recaptured 35 times (78% of total recaptures) and females were recaptured 10 times (22% of recaptures). Males were significantly more likely to be recaptured than females (Likelihood-ratio test, $G=13.62$, d.f.=1, $P<0.001$). Three males accounted for 84% of the recaptured males. One male was recaptured 11 times, for a total of 12 captures, during a 3-month period. He avoided traps after that and was not recaptured during the following 7 months, although traps were set within his home range.

Forty-five coatis were captured and marked on Fort Huachuca, 13 were captured and marked at Ramsey Canyon Preserve, and one coati was captured in Huachuca City, marked and released on Fort Huachuca. A few days were spent trapping along the San Pedro River near Fairbank, but no coatis were captured, and tracks of only one coati were seen. Trap-days accumulated along the San Pedro River were not included in above totals.

3.1.2 Growth and Morphometrics

Adult female coatis weighed an average of 4.0±0.45 kg (n=37), whereas adult male coatis averaged 5.2±1.33 kg (n=32, recaptures included). Coati weights differed substantially by month (Fig. 3.2). Males lost weight during the mating season, and females lost weight during lactation. Average male weights decreased by >30% between February and May. Average female weights during this same period remained stable, increased during pregnancy, then declined by 30% during July and August. The greatest discrepancy in weights between males and females occurred during the winter, when average male weights were as much as 33% greater than average female weights. Insufficient data were available to make year-to-year comparisons.

Juvenile coatis had not yet achieved full body weight by 25 months of age (Fig. 3.2), although the few weights obtained from coatis at this age were quite variable. It was not possible to determine the age of coatis when first handled if they were >24 months of age. Male coatis were significantly heavier, larger, and had longer lower canines than females (Table 3.1).

3.1.3 Reproduction

Group Dynamics

Males were solitary during 85% of observations. Most observations of males with troops were during the mating season. Males began to associate with troops during mid-March and were observed with troops off and on until the end of April (Fig. 3.3). Males did not remain with any one troop, but stayed with a troop for a short period of time, usually one or two consecutive days. Subsequent observations of a male might find him alone or with a different troop that shared his home range. Females were observed in groups with other adults and juveniles, until early June (Fig. 3.3). During June, a female might be by herself one day, then with members of her troop the next day. By late June, females appeared to have selected their parturition dens and all adult females were observed by themselves for the next 4 weeks.

First Appearance of Young-of-the-Year Coatis

The first young-of-the-year were observed on 27 July 1996 in upper Ramsey Canyon. Within 1 week, all females in Garden and Huachuca Canyons had brought their young out from the dens and started to regroup. Backdating from the first appearance of kits (approximately 5 weeks after parturition, Kaufmann, 1962) and the last observations of pregnant females, most if not all births were estimated to have occurred 20-27 June.

Due to high mortality just before and during the time of parturition (see below), only 5 radio-collared females were tracked during late June and July. Parturition dens were found for two of these females; two other dens were located within 10 m, but the exact den entrances could not be located. All four dens located were in rock outcrops. The fifth female was tracked extensively, but her den could not be located. The parturition den of one female was in Pat Scott Canyon on the Coronado National Forest. The severe drought of 1996 resulted in the USFS closing the Coronado due to high fire danger on 12 June 1996. This particular female could not be tracked until the closure was lifted around 25 July. Her parturition den was located just days before she brought her young out.

Fecundity

During the first 2 weeks after females brought their offspring out of the den, they often were observed foraging with just their young. This allowed us to get a count of the number of kits each female brought down from the den. The radio-collared females, plus several marked and unmarked females were observed. Two females had three kits with them, seven females had four kits, and one female had five kits (mean=3.9). Once females regrouped, it was impossible to determine which kits belonged to which female.

Four female coatis, handled when they were estimated to be 24-36 months old, showed no evidence of lactation. Of females > 3 years old handled or observed during late gestation or lactation (n=16), all were pregnant or recently gave birth. Two of these adult females were observed without kits, and were presumed to have lost their entire litters.

Reproductive Steroids

Fifty-seven plasma samples were collected from coatis for analysis of reproductive steroids. Preliminary runs on 27 female samples, collected during all months except March and November, were below detectable limits for progesterone. All but two samples were below detectable limits for estradiol. A preliminary run on five male samples for testosterone looked promising. Unfortunately, the laboratory freezers were shut down when the Red River inundated the town of Grand Forks, North Dakota (where the lab work was being conducted) during April 1997. A subsequent run of male samples was not significantly different from pre-flood results (Mann-Whitney U-test, U=10, n=5,5, P=0.10), indicating that the samples did not degrade significantly. Results from 30 males indicated that plasma testosterone levels were high from November through April, with a peak during March. Testosterone levels were lowest during May-July (Fig. 3.4). Testosterone levels of males < 3 years of age were lower than those > 3 years old (Fig. 3.4).

3.1.4 Mortality and Disease

Predation

From February 1996 through April 1997, nine radio-collared animals were recovered that were killed or scavenged by predators. Eight of these animals (four males, four females) were found either close to cliffs or in thick oak scrub. Remains consisted of a pile of hair, the terminal portions of the rostrum and tail, and blood spattered on leaves and rocks. In three cases, small portions of the digestive tract were present, and in two cases, one front foot was present. The radio-collars had some blood on them, but only one bore tooth marks. Some of the remains were buried partially in leaf litter but in most cases, no sign of any attempt at burying the remains could be found. A mountain lion (*Puma concolor*) track was found next to one set of remains; no tracks could be found at the other sites. These kills were attributed to lion predation, based on recovered remains and the following observations. A lion scat containing coati hair and claws was found during early September 1996. On 7 April 1997, I observed a lion pacing back and forth beneath two trees that contained three coatis. The coatis were very agitated and perched on the terminal ends of branches 5-10 m above the ground. The lion remained under the trees for >1 hour after I arrived; the coatis were still up in the trees 5 hours later, although the lion was not visible. Two of the coatis wore radio-collars; they survived the incident. A search of the area a few days later revealed a fresh lion scat full of coati hair. All four males were killed during the mating seasons (March-April). Females were killed during January, April, May, and June.

One additional radio-collared animal appeared to have been killed by a black bear (*Ursus americanus*). Recovered remains included most of the carcass, with the hide inverted over the head and pectoral girdle. The remainder of the skeleton was present but picked clean. The female was lactating (having given birth about 10 days before), and the hide covering the mammary glands was gone. The remains were found under the cover of a rock pile. No bear sign was found in the area; it is probable that scavengers dragged the carcass to that location.

Remains of three unmarked coatis were found that were also consistent with lion predation. Two consisted of piles of hair; in one, the rostrum was still present. The third was a 4-month-old female coati found lying alongside a dirt road. The carcass was intact. Skinning revealed a bite to the back of the skull, which also penetrated the trachea. Large canine puncture wounds were obvious on both sides of the ribcage. Size and spacing of the puncture wounds were consistent with a mountain lion (H. Shaw, pers. comm.)

Disease

On 26 December 1996, remains of a radio-collared female were recovered from a small dry wash. No signs of predation were evident. The carcass was sent to UA Veterinary

Diagnostic Laboratory for necropsy. Results came back positive for eosinophilic inclusion bodies throughout the brain, and death was attributed to canine distemper virus.

Other than a low positive titer in a raccoon, this was the only evidence of canine distemper discovered during this study (Table 3.2). Likewise, animals tested were remarkable free from rabies virus and antibodies to rabies virus (Table 3.2).

Other Causes of Mortality

Remains of a male radio-collared coati were recovered on 28 April 1996. His carcass was submitted to Fort Huachuca Veterinary Services. Post-mortem changes were too advanced for histological analysis, but an obvious strangulated hernia was found that likely contributed to death from septicemia. When queried, the Post Veterinarian indicated such an injury might be consistent with an extreme fall. The last several observations of this coati found him at the tops of some 20 to 30-m tall cottonwood and sycamores. His carcass was recovered from the base of one of these large sycamores.

Another radio-collared male was discovered on 17 September 1996 that had died in a trap, after undoing a strap that was supposed to prevent the trap from locking. The animal was handled several days prior, and placed in the trap set so he could release himself.

On 1 November 1996, remains of a radio-collared male were recovered from a small cave. The entire carcass was present and showed no signs of predation or injury and, other than post-mortem changes, appeared to be in good condition. The remains had been in the field for 2-3 days before discovery. Post-mortem changes were too far advanced to do a necropsy on the animal. A brain sample sent to CDC was negative for rabies. Previous blood samples were negative for antibodies to canine distemper and rabies. Death was classified as due to unknown causes.

Several reports were received of coatis that were hit by vehicles, both on and off Post. Carcasses disappeared before any data could be collected.

Survival Rates

Survival rates for 40 animals were determined. This included 25 radio-collared individuals, plus 15 marked or recognizable animals observed repeatedly for at least 4 months. The survival curve for males was lower than that for females (Fig. 3.5), but not significantly (Mantel-Haenzel, $z=1.66$, $P=0.097$). At the end of the study, the probability of survival for males alive at the beginning of the study (0.39 ± 0.15) was about half of that for females (0.73 ± 0.10).

Human-Caused Mortality

Although coati hunting was legal for almost 50 years preceding this study, hunters were not required to report any coatis killed. Coati hunting was prohibited on Fort Huachuca during the study. No data were available on the number of coatis harvested, nor on the hunters' motivation for harvest. It is believed that many of the coatis hunted are made into taxidermy mounts, so all licensed taxidermists in Arizona were contacted to find out how many coatis they had mounted, and when and where the animals were harvested. A postage-paid postcard was included with the query. About 50% of taxidermists responded; most had not mounted any coatis. Because there was no method for extrapolating from results received, files at AGFD also were examined. Between 1976 (the first year that records were kept) and early 1997, taxidermists reported mounting 123 coatis, with numbers apparently increasing in recent years (Table 3.3). The Catalina Mountains and Klondyke area appeared to be popular hunting areas.

3.1.5 Density and Population Estimate

Coatis were difficult to observe in the field, due to both the thick underbrush and their shy nature. Even when coatis could be observed, trying to obtain an accurate count, identify all marked individuals, and classify animals into age classes was very difficult. No form of mark was foolproof, as both eartags and collars fell off. The small metal eartags were difficult to discern in the field, and their numbers were impossible to read. This difficulty in identifying marked animals in the field, and differential recapture probabilities violated the assumptions of formal population estimates based on mark-recapture or mark-resight (Krebs, 1989; White and Garrott, 1990; White, 1996). Therefore, population size within the study area was determined by calculating the average group size for each troop, the average proportion of females 2 years and older in the study population, and assuming a 100:50 adult sex ratio (based on survival and capture rates, see above). Average sizes of seven troops ranged from 5.4 to 30.0 (see below). The sum of average troop sizes within the study area equaled 119.3. Adding 35 males yielded a population estimate of 154.3 animals within the study area. A 90% minimum convex polygon surrounding all coati locations encompassed 89.9 km². A 90% polygon was chosen to account for probable overlap of peripheral, unmarked troops. Therefore, a density of 1.7 coatis per km² was calculated. Multiplying this by the approximate 350 km² of woodland habitat within the Huachuca Mountains (but excluding the Canelo Hills) yields a crude, range-wide estimate of about 600 coatis.

3.2 Discussion

3.2.1 Trap Success

Few other studies have trapped coatis systematically enough to obtain an estimate of trap success. Lanning (1975, 1976) live-trapped coatis over a 6-month period in Chiricahua National Monument, and obtained an average trap success of 7%, with wide month-to-month fluctuations. Risser (1963) trapped in the Huachucas during a period of low population density, and obtained a trap success of 0.7%. Coatis were relatively easy to catch if they were in the area of the traps. However, coatis may vacate portions of their range for months at a time (see below; Wallmo and Gallizioli, 1954; Kaufmann et al., 1976), so it is unlikely that live-trapping, unless conducted for long periods of time, could be an effective method of population census.

3.2.2 Morphometrics

Weights of coatis during this study were comparable to those from Arizona coatis measured by Risser (1963) and Lanning (1976b). They were slightly less than those measured by Gilbert (1973): 4.3±0.50 kg for six females, and 7.0±0.69 kg for six males, possibly reflecting the effects of supplemental feeding. The largest weight obtained by a coati during this study, 8.0 kg, was from a large male that obtainied supplemental food from residents of Ramsey Canyon. Female coatis in Panama appear to be smaller than female coatis in Arizona. Russell (1982) obtained average weights of 3.7 kg for 29 females and 4.8 kg for 18 males. Gompper (1994) obtained average weights of 3.7±0.31 kg for 37 females, and 5.1±0.76 kg for 51 males. Average lengths of both males (114.23±4.64 cm, n=42) and females (103.72±9.80 cm, n=32, Gompper, 1994) in Panama were less than male and female coatis in this study. However, upper and lower canine dimensions were slightly larger for coatis in Gompper's study. Upper canines averaged

1.0±0.11 cm for 19 males and 0.8±0.11 cm for 18 females. Lower canines measured 1.7±1.2 cm for males and 0.9±0.08 cm for females.

3.2.3 Reproduction

Observations of group dynamics of coatis during the mating season concur with previous observations (Kaufmann, 1962), with one notable exception. Kaufmann (1962) and Russell (1981) describe a troop's consortship with one male during most, if not all, the mating season. The male joins the troop a few weeks before any females come into estrus, and remains for several weeks. During this study, males intermittently joined troops during the mating season, and remained for short periods. Troops were observed sequentially in the company of different males. Gilbert (1973) describes similar observations among one troop, which was joined by several different males during the mating season. Also noted during this study were males associating with more than one troop, something not previously reported. The breakup of troops during late gestation and regrouping of troops following the denning period concur with previous observations (Kaufmann, 1962; Gilbert, 1973; Gompper, 1994).

The numbers of offspring brought out from natal dens agree with captive litter sizes reported by Kaufmann (1962), range 3-4; Pratt (1962), range 3-6; and Risser (1963), range 4-6. Russell (1982) reported an average of 3.5 young brought out from natal dens in Panama. Pratt (1962) and Risser (1963) also reported parturition dates of 16-22 June for captive animals from the Huachucas. Ratneyeke et al. (1992) reported parturition occurring between 7-14 July in the mountains near Douglas, Arizona.

During this study, females did not give birth for the first time until they were 3 years old. In Panama, Russell (1982) reported that the percent of females first giving birth at 2 years ranged from 20-100%, with some females not giving birth until 4 years of age. The percent of 3 year-olds giving birth in this study could not be determined due to the difficulty in determining ages of coatis ≥ 3 years old.

Among seasonally mating mammals, plasma testosterone levels often fluctuate annually, reaching highest levels when most females may be coming into estrus (Bronson, 1989; Gilbert, 1987; Davison, 1993; Kaplan and Mead, 1993). During this study, peak levels of testosterone corresponded with the mating season. However, sample sizes were small and it is unknown how much variability may have been added by possible sample degradation. Initial results are very intriguing, however. Levels of testosterone appeared to be high during most of the winter. Coatis in Panama and Costa Rica mate during late January to mid-February (Kaufmann, 1962; Gompper, 1995). Throughout much of Mexico, mating periods are similar to those in Arizona, although coatis may mate as early as March in Chiapas (Leopold, 1959). Plasma testosterone levels and more details regarding times of mating and parturition of populations in different habitats in Mexico would be interesting.

3.2.4 Mortality

This was the first study to document extensive predation on coatis by mountain lions in Arizona, although studies in the tropics have reported predation on coatis by mountain lions and jaguars (*Panthera onca;* Emmons, 1987; Glanz, 1991; Jorgenson and Redford, 1993). Previously undocumented was bear predation on coatis. Other reported predators, not detected during this study, include Golden Eagles (*Aquila chrysaetos*) and Red-tailed Hawks (*Buteo jamaicensis*; Gilbert, 1973; Kaufmann et al., 1976). Predators in the tropics also include boa constrictors (*Boa constrictor*, Janzen, 1970) and capuchins

(*Cebus capuchinus*; Newcomer and DeFarcy, 1985). Coatis are a common food item of indigenous people of Mexico and Central America, where subsistence hunting can have significant impacts on population densities (Glanz, 1991; Terborgh, 1992; Jorgenson, 1993; Jorgenson and Redford, 1993).

During this study, the population appeared quite healthy, in terms of both numbers and disease status. One death was attributed to canine distemper virus. A large-scale die-off attributed to canine distemper occurred during 1960-1961 (Risser, 1963). No sign of rabies virus or antibodies to rabies virus were detected in the coatis during this study. Between 1967 and 1985, 11 cases of rabies in coatis in Arizona were reported (J.W. Krebs, CDC, pers. comm). Rabies was believed responsible for a decline in coatis around Patagonia during the early 1970's (Kaufmann et al., 1976).

If taxidermist reports encompass most of coati hunting mortality, then hunting probably has little significant impact on coati populations in Arizona. During the late 1950's, however, hunter's were urged to destroy coatis because they were blamed for the destruction of Turkey and Mearns' Quail nests; this resulted in a noticeable decline in coati observations (Pratt, 1962). Coatis are easily caught in foothold traps (Kaufmann et al., 1976); however no records exist documenting how many were trapped annually, prior to the ban on trapping coatis initiated during 1980 (J. Phelps, pers. comm.).

3.2.5 Density

Density estimates of coatis during this study (1.7 coatis/km²) were comparable to those found by Lanning (1975) in the Chiricahuas (1.2-2.0 coatis/km²). These numbers are remarkable lower than densities found on Barro Colorado Island (26-56 coatis/km²: Kaufmann, 1962; Gompper, 1994; Wright et al., 1994). It has been argued that densities on Barro Colorado are unusually high due to lack of predation (Glanz, 1991; Terborgh, 1992). A limited, comparative study of densities on and off Barro Colorado found densities at other tropical habitats from 15-33 coatis/km² (mean=22.7, n=3; see Wright et al., 1994 and references therein). Obviously, densities of coatis at the northern end of their range are lower than those farther south, most likely due to more widely spaced resources and lower food availability. Studies of coati density in a variety of habitats throughout Mexico are needed.

• Table 3.1. Measurements of male and female coatis in the Huachuca Mountains. Measurements from first capture only; t and P results of t-tests for differences between sexes. Degrees of freedom were adjusted when variances differed according to Bartlett's test (Computing Resource Center, 1992).

Measurement		Males	Females	t	P	d.f.
Mass (kg)	**Mean±SD**	4.8±0.97	4.0±0.48	3.58	0.0021	18
	Range	3.4-6.2	3.2-5.2			
	N	15	30			
Total Length (cm)	**Mean±SD**	125.6±5.89	119.9±5.14	3.33	0.0018	43
	Range	117.3-137.5	104.2-130.6			
	N	15	30			
Upper Canine (cm)	**Mean±SD**	0.8±0.13	0.7±0.16	1.12	0.2673	41
	Range	0.4-1.0	0.2-1.0			
	N	14	29			
Lower Canine (cm)	**Mean±SD**	1.5±0.27	0.9±0.10	7.44	0.0000	12
	Range	1.0-1.9	0.7-1.0			
	N	12	20			

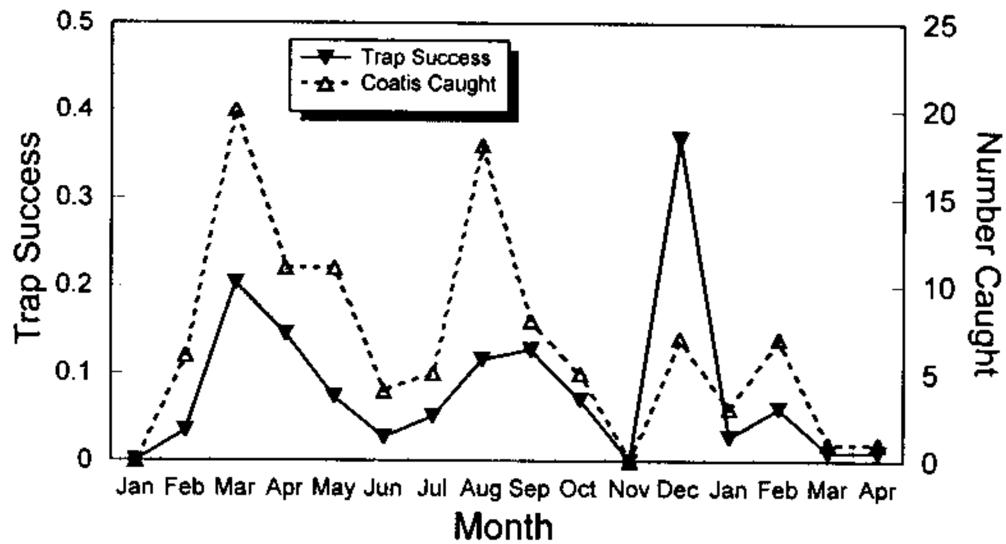
• Table 3.2. Results of disease survey of small carnivores on Fort Huachuca, 1 January 1996-30 April 1997.

	Serology				**Brain**			
	Rabies antibodies		**Distemper antibodies**		**Rabies**		**Distemper**	
Species	**Positive**	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**
Coati *Nasua narica*		58		54		3	1	
Ringtail *Bassariscus astutus*		6		6				
Raccoon *Procyon lotor*		4	1	4		1		
Striped skunk *Mephitis mephitis*		1		3				
Hooded skunk *Mephitis macroura*		3		2		1		
Spotted skunk *Spilogale gracilis*		1		1		1		
Hognose skunk *Conepatus mesoleucus*					1			1
Gray fox *Urocyon cinereoargenteus*	1	5		3		1		
Bobcat *Felis rufus*		1		1		1		

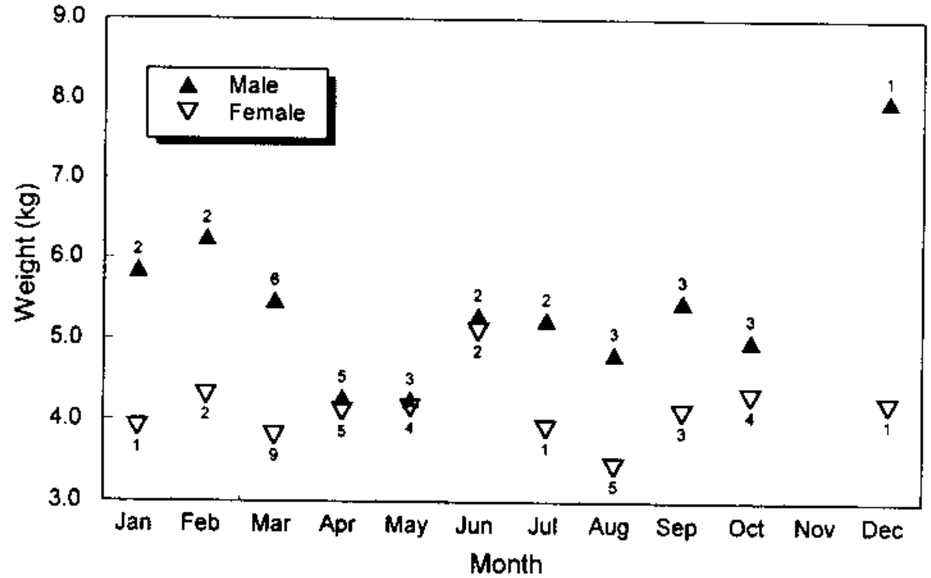
• Table 3.3. Year and numbers of coatis received for mounting by taxidermists licensed in the state of Arizona. Locations provided by taxidermists.

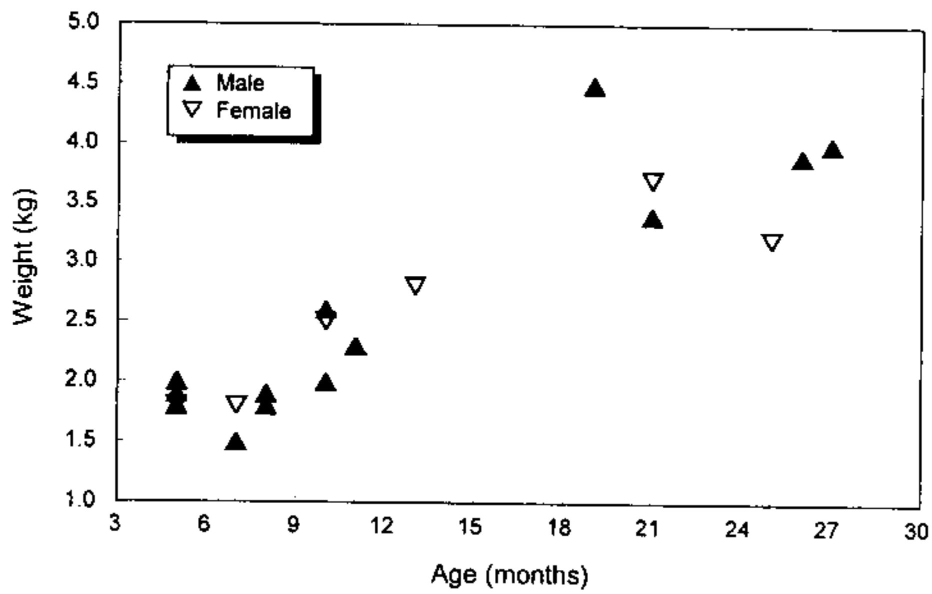
Year	Number Mounted	Some locations where taken
1976	2	
1977		
1978		
1979	1	Chiricahua Mts.
1980	2	
1981	3	
1982	8	
1983	1	
1984	5	
1985	10	Patagonia Mts., Catalina Mts.
1986	3	Klondyke
1987	6	Patagonia Mts., Catalina Mts.
1988	10	Rincon Mts., Santa Rita Mts., Arivaca, Catalina Mts.
1989	8	
1990	7	Santa Rita Mts., Rincon Mts., Klondyke
1991	1	Dos Cabezas
1992	8	Canelo Hills
1993	9	Unit 31, Unit 27, Huachuca Mts.
1994	11	Unit 28, Unit 31, Patagonia Mts., Klondyke, Tumacacori Mts.
1995	13	Unit 27, Camp Verde, Catalina Mts., Klondyke, Chiricahua Mts., Usery Mts.
1996	8	Mexico
1997	7	
Total	123	

• Figure 3.1. Capture success and number of coatis caught at Fort Huachuca Military Reservation and Ramsey Canyon Nature Conservancy Preserve, January 1996-April 1997.

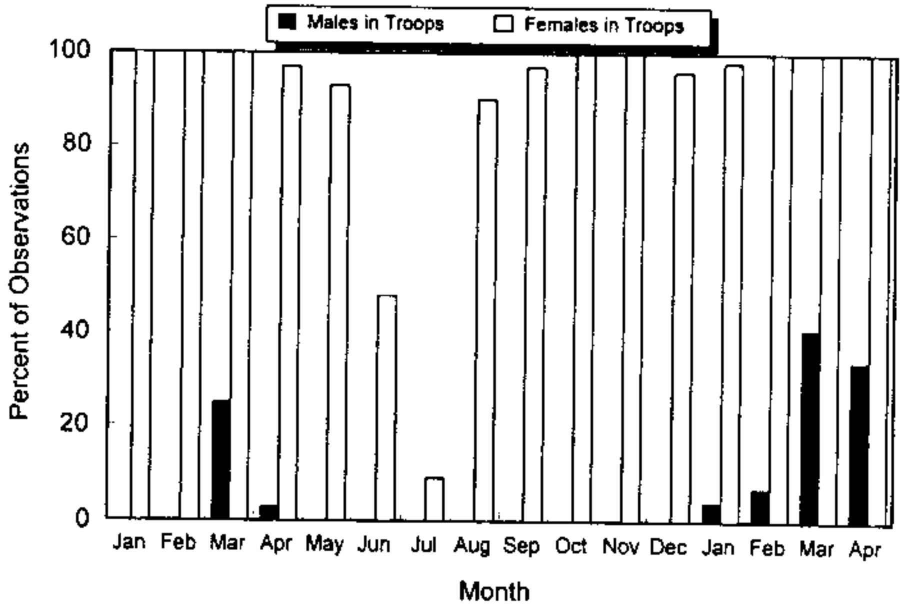


• Figure 3.2. Body weights of male and female coatis in the Huachuca Mountains, Jan 1996-Apr 1997. Individual adults (top) and juveniles (bottom) may be represented in more than one month. The unusually high weight in the top figure was a male who likely received some supplemental feeding. Numbers alongside data point on top graph are sample sizes; all samples shown in bottom graph.





• Figure 3.3. Percent of observations of coatis observed in troops, Huachuca Mountains, January 1996-April 1997. A troop was composed of a group of two or more adult females.



• Figure 3.4. Plasma testosterone profiles for male coatis in the Huachuca Mountains, February 1996-April 1997. Points represent means; number next to symbols represent number of males sampled.

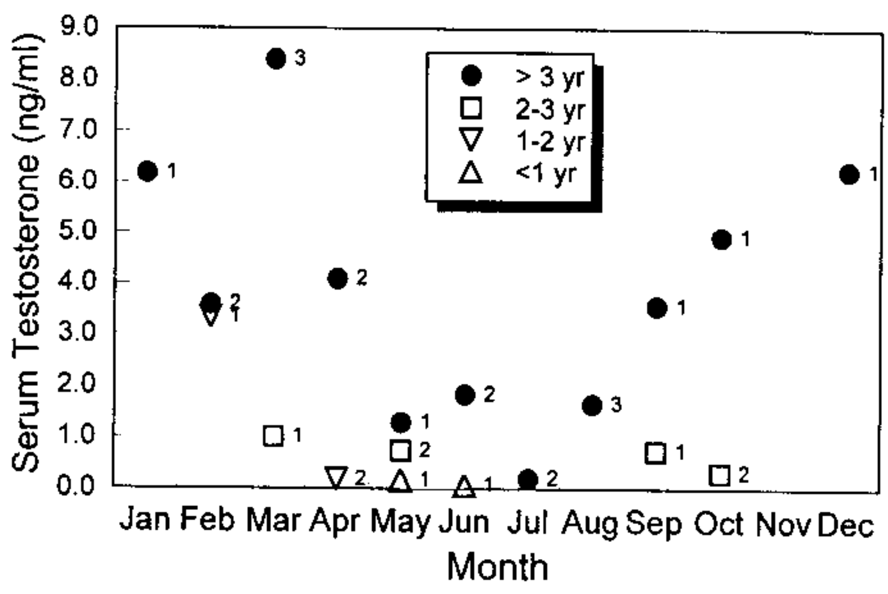
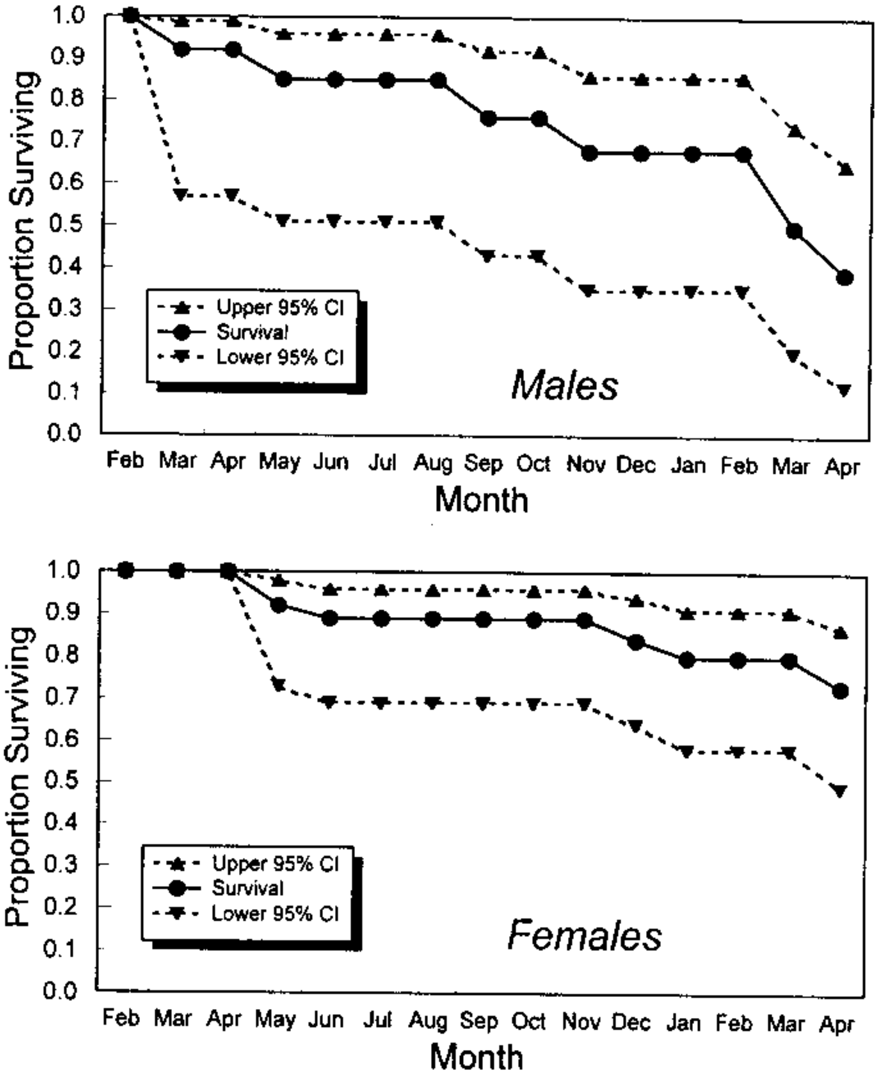


Figure 3.5. Survival rates and Greenwood confidence intervals for adult male (top) and female (bottom) coatis in the Huachuca Mountains, Feb 1996-Apr 1997. All adults marked were known to be alive at the beginning of the study.



Chapter

4

4 Social Dynamics

4.1 Results

4.1.1 Radio-tracking and Observing Coatis

Fifty-nine coatis were captured and marked during the study. Twenty-eight of these were fitted with radio-collars, 10 with dog collars, and the rest were marked with metal or plastic eartags. None of the marks was completely satisfactory. During the early part of the study, three radio-collars fell off the animals 3-6 weeks after they were attached; all three animals were seen subsequently so mortalities were ruled out. Some animals with dog collars were recaptured without their collars, while others were still observed with the dog collars > 1 year later – but the collars had faded and colors were hard to determine. Metal eartags were difficult to apply, due to the thickness of coati ears; but if applied property appeared to remain better than any other form of marking. Both types of plastic eartags (Duflex calf tags, trimmed to fit a coati's ear, and Nasco Rototags) suffered some loss. At least two animals lost their Duflex tags for unknown reasons. Two more animals ripped their Rototags out of their ears upon recapture. Due to tag and dog collar loss, and the difficulty observing the small metal eartags, when troop members could be observed, determining all of the marked animals was problematic.

Radio-collared animals included 11 males and 17 females. The females belonged to eight different troops, based on home ranges and associations. Not counting animals whose radio-collars fell off, radio-collared animals were tracked for an average of 232 days (range 16-422 d). Due to high rates of mortality, only four coatis (3 females, 1 male) were radio-tracked for > 1 year. A total of 1348 locations was obtained on marked or recognizable coatis, plus an additional 34 on unmarked animals. Visual or auditory contact was made with marked coatis on 760 occasions (56% of locations).

Triangulation error was calculated for 16 test collars and while recovering three mortalities. All test transmitters were located ≤ 0.5 km from the receiver, which was the usual triangulation distance. Error was significantly related to distance from receiver to transmitter ($F_{(1,17)}$=12.68, R^2=0.43, P=0.0024), according to the equation, *error*=0.1923**distance*+12.00. The mean error was 41.0 m, with a 95% confidence interval of 26.9-55.0 m.

Interfix distances for serial locations obtained < 48 h apart were used to calculate rates of movement. For males, 89 rates were calculated, for females, 279. Males moved at an average rate of 68.1 m/hr (range 0.6-658.5 m/hr). Male home ranges spanned an average of 5100 m (range 3168-6521 m). Moving at an average rate of speed, males could move between the furthest points of their home range in about 75 hr. At nearer the maximum rate of speed of 600 m/hr, males could span their home ranges in < 11 hr. Females moved at an average rate of 79.7 m/hr (range=1.42-595.2 m/hr). Female home ranges spanned an average of 5943 m (range 3250-8543 m). Moving at an average rate of speed, females could cross their home ranges in about 75 hr. At nearer the maximum rate of speed of 600 m/hr, females could span their home ranges in <15 hr. For this study, the time to independence for serial locations was set at 48 h. Only locations taken at least 48 hr apart were used for analysis of home range and habitat use.

4.1.2 Group Size and Fidelity

Group sizes differed by troop and season, with the overall average troop size=12.2±4.28 (all troops during all seasons; Fig. 4.1). Maximum troop sizes were reached during the fall for most troops, averaging 13-18 animals, with one troop averaging 30 animals through the winter. Group associations became a little looser during the mating season, and remained that way though gestation. By September, troops became more cohesive.

Because of the difficulty observing animals, recording associations of non-radio-collared individuals was difficult. In addition, most troops had only one animal radio-collared. However one troop, T3, had three individuals that were radio-collared during March 1996, plus an additional animal that was radio-collared during July 1996. The three animals that were initially collared during March 1996 (F28, F33, and F35) were also captured with a fourth female (F27). Shortly after capture (in upper Garden Canyon), all four females traveled to upper Ramsey Canyon. About 4 weeks later, F28 and F35 returned to upper Garden Canyon. A few weeks after that, F35 joined them. They were assigned troop number T3. F27 remained in upper Ramsey and Pat Scott Canyons with a troop of 15-20 animals. They were assigned troop number T2. All three coatis from T3 gave birth in upper Garden Canyon. Later, all three females plus newly collared F69 and their young grouped together and remained in upper Garden Canyon. Because of difficulty locating T2, few locations were obtained on that troop. During mid-June to late July, the areas south and west of the Fort were closed due to fire danger. During late July, the parturition nest of F27 was found near the top of Pat Scott peak. During late August, F27 appeared in upper Garden Canyon with 20-25 animals. They immediately joined with the females from T3, forming a large troop of 45 animals including 29 young-of-the year. They remained together until late December, when the size of the troop went down to 20-26 animals. F27 remained in T3; presumably the rest of T2 went back to Ramsey Canyon while F27 remained with the females of T3. At this point, F27 was considered a member of T3 for calculation purposes. F27's collar began working intermittently during February, and because of the difficulty observing animals in the troops, it is not certain that she was with the other radio-collared females on all occasions. However, when good observations were made on T3, she was usually found to be with them. The three females from T3 that were tracked for > 1 year were together 40-85% of the time.

Troops appeared to be cohesive. However, several observations were made of dog-collared females caught in one canyon appearing with a different troop in another canyon. Reliable observers made these sightings, but the animals in question were only observed once or twice. Interestingly, the females were never again observed in the area they were caught or anywhere else. It is unknown if the animals were dispersing, lost their dog collars, or disappeared shortly after the observations. However, it is possible that troops are less cohesive than radio-tracking data might imply. No dispersal out of an animal's home range was documented for any animal during the study.

4.1.3 Home Range Size and Overlap

Home range sizes were quite extensive for both males and females (Tables 4.1, 4.2), with male home ranges averaging 8.7 km^2 (kernel density estimator) and troops exclusive of the nesting season averaging 16.6 km^2. Variances among male and female home range sizes were unequal (Bartlett's test, χ^2=5.33, P=0.021). A t-test for unequal variances revealed significant differences among home range sizes between male and female coatis (t=2.39, d.f.=8, P=0.044). Females during the nesting season (pre- and post-parturition) averaged 2.8 km^2 (Table 4.3). There appeared to be some seasonal shift in home range use, but sample sizes were too small to test. Incremental area plots (Kenward and

Hodder, 1996) revealed that although about 50% of the home ranges (100% kernel density estimator) could be defined using 30 fixes; it took 55-60 fixes to describe all of the home ranges.

Home range overlap was extensive, both within and between sexes (Figs. 4.3-4.4; Table 4.4). For males within the same canyon complex, home ranges overlapped other males by as much as 83% (based on home ranges calculated using 95% KDE). Males overlapped troops by as much as 93%, and troops overlapped by as much as 93%. Nesting home ranges of individual females fell within the home range of their troop (Fig. 4.5).

Outside of the mating season, individual males and troops were seldom observed in contact with coatis whose ranges they overlapped or were overlapped by. T1 was observed with T2 once and T5 on several occasions (on private property, it is possible they were attracted to a feeding station). T2 was seen with T1, and was with T3 for an extensive period of time (see above). T3 also was located with T6 once. T4 was located with T7 once. T5 was located with T6 once and T1 repeatedly. Although T8's home range overlapped home ranges of three other troops, T8 was never located with any of the other troops. Interactions among marked males were even less frequent, and all involved one particular male. M77 was observed fighting with M37 and M42 during fall 1996; no injuries were detectable after either encounter. M77 also was located with M99 on two occasions but it could not be discerned if the interactions were agonistic or not.

4.2 Discussion

4.2.1 Group Size and Fidelity

Although group sizes of 50 and more coatis have been reported in Arizona (Pratt, 1962; Kaufmann et al., 1976), this study reported an average group size of 12.2 animals. This is slightly less than group sizes reported by Gompper (1997) of 15.3±6.1 animals per group in Panama. Estrada et al. (1993) reported group sizes of 10-25 (n=8) in Los Tuxtlas, Mexico, with an average of 22.5. Gilbert (1973) reported group sizes of 24 and 18 for two troops in southern Arizona. Both Gompper (1994, 1997) and Russell (1983) reported occasional migration of females between troops. Overall, troops are closely related, and appear to be comprised of mothers and their offspring of multiple generations (Gompper, 1994; Gompper et al., 1997).

4.2.2 Home Range Size and Overlap

Home ranges sizes from this study were up to 45 times larger than published from any other study on coatis. Home range sizes for troops in Panama averaged 0.26 km^2 (Gompper, 1997; 95% MCP) and 0.39 km^2 (Kaufmann, 1962; differences between Gompper's and Kaufmann's results may be due to differences in method of calculation). Males in the same area averaged 0.24 km^2 (Gompper, 1997) and 0.41 km^2 (Kaufmann, 1962). In Los Tuxtlas, Mexico, home range size of eight troops averaged 0.8 km^2 (Estrada et al., 1993; method of calculation unknown). In Tamaulipas, Mexico, home ranges for 3 males averaged 0.8 km^2, and for 3 females averaged 1.3 km^2 (minimum convex polygon; Caso, 1993). During a 6-month study in the Chiricahuas, Lanning et al. (1976) recorded home ranges of 1.78 km^2 for four males. This study concurred with previous researcher's observations of considerable overlap of home ranges between sexes and among individuals. Ratneyeke et al. (1992) recorded home range sizes of 1.6-2.0 km^2 for three females during the nesting season, similar to the findings of this study of

1.99 km^2 (MCP). The extensive overlap of home ranges, with occasional contact among adjoining troops makes coatis particularly vulnerable to contagious diseases.

Previous researchers and observers have reported that coatis in Arizona are nomadic or semi-nomadic (Wallmo and Gallizioli, 1954; Kaufmann et al., 1976; Pratt, 1962). The findings of this study conclude that coatis are not nomadic, but rather have extensive home ranges, and may be absent from portions of their range for months at a time.

• Table 4.1. Home range sizes (km²) for six male coatis radio-tracked in the Huachuca Mountains, Jan 1996-Apr 1997. KDE=kernel density estimator, MCP=minimum convex polygon.

Id No.	Dates Tracked	No. Locations	95% KDE	95% MCP
M14	Jan-Nov '96	40	11.67	2.83
M37	Mar-Jun '96, Mar-Jun '97	24	8.53	7.17
M42	Mar '96-Apr '97	55	11.08	7.66
M77	May '96-Apr '97	41	9.19	5.05
M86	Dec '96-Apr '97	29	4.63	3.95
M99	Aug '96-Mar '97	34	7.32	11.54
Means			**8.74**	**6.36**

• Table 4.2. Home range sizes (km²) for seven coati troops radio-tracked in the Huachuca Mountains, Mar 1996-Apr 1997, exclusive of the nesting season (late June-early August). KDE=kernel density estimator, MCP=minimum convex polygon.

Troop	Dates Tracked	No. Locations	95% KDE	95% MCP
T1	Jan-Apr '97*	30	5.69	5.20
T3	Mar '96-Apr '97	66	19.32	13.71
T4	Apr-Dec '96	21	26.43	19.77
T5	Apr-May '96, Sep '96-Apr '97	36	26.76	13.78
T6	Aug '96-Apr '97	55	9.08	6.75
T7	Aug '96-Apr '97	52	11.64	9.96
T8	Aug '96-Apr '97	30	17.28	13.43
Means			**16.60**	**11.80**

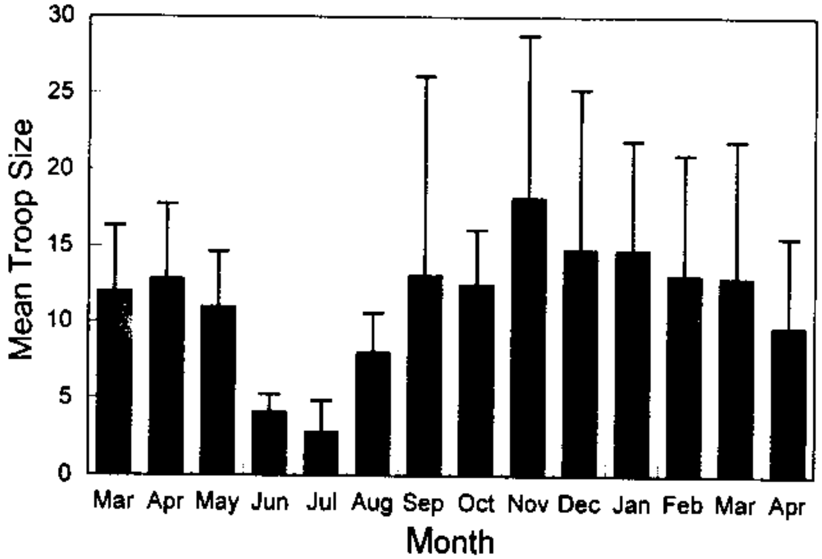
*T1 contained a recognizable female; locations were made opportunistically from Jan '96-Dec '96.

• Table 4.3. Home ranges (km²) of four female coatis during the nesting season, late June-early August 1996, Huachuca Mountains. KDE=kernel density estimator, MCP=minimum convex polygon.

Id No.	No. Locations	95% KDE	95% MCP
F28	16	3.18	2.09
F33	19	2.13	1.19
F35	24	2.22	1.11
F79	20	3.83	3.55
Means		**2.84**	**1.99**

• Table 4.4. Home range overlap for individual males and troops in the Huachuca Mountains, March 1996-April 1997, based on home ranges calculated using 95% KDE. Numbers preceded by an M represent males, numbers preceded by a T represent troops. For clarity, zeros were omitted. Numbers=% overlap; range areas in rows are overlapped by those in columns.

ID	M14	M37	M42	M77	M86	M99	T1	T3	T4	T5	T6	T7	T8
M14	100							55.6		76.2	86.5		
M37		100	2.3	16.9		22.7			78.5			37.4	12.0
M42		3.3	100	34.4		35.2			9.0			47.8	85.5
M77		42.6	59.1	100		84.5			54.1			94.3	82.9
M86					100		79.9			93.7			
M99		25.9	27.4	38.4		100			59.4			63.7	45.3
T1					91.3		100			92.6			
T3	16.6							100		11.9	28.6		
T4		43.5	3.5	11.9		28.7			100	2.8		28.1	10.0
T5	15.9				22.4		19.4	8.4	2.7	100	18.2		
T6	53.1							58.9		53.7	100		
T7		46.8	40.7	46.8		69.8			63.4			100	56.7
T8		9.8	47.4	26.9		32.2			14.6			36.9	100



• Figure 4.1. Average troop sizes (all troops combined) of coatis in the Huachuca Mountains, March 1996-April 1997.

Chapter 5

5 Diet and Habitat Use

5.1 Results

5.1.1 Weather

The year 1996 was one of the driest years on record, with 277.9 mm of precipitation, compared with the normal 397.3 mm (1974-1995 average). Nine months recorded precipitation levels at or below the lower 95% confidence interval surrounding the monthly averages (Fig. 5.1). Springs and intermittent streams were dry by May 1996. Moisture during the monsoon period of 1996 was above normal. Below normal precipitation during fall 1996 and winter 1997 resulted in the drying of many small streams and tanks by early April 1997.

5.1.2 Food Habits

Ninety-two scats were collected and examined during the study. Fruits, mostly juniper berries, were found in 92% of scats, invertebrates were found in 77% and vertebrates were found in 4% (Table 5.1). Diet varied seasonally, with vertebrates found only in scats collected during the fall and winter, and some fruits found in scats found only during the summer (Table 5.1). Two lizards found in scats were identified from skeletal material and scales. The mammal remains (*Sylvilagus* spp.) and bird remains (Passeriformes) consisted solely of hair or feathers, without any skeletal material, and may have been scavenged. The predominant invertebrates consisted of orthopterans (grasshoppers and crickets) and coleopterans (small ground beetles (Carabidae) and grubs (Scarabidae)). Juniper fruits were consumed year-round, and buckthorn, prickly pear, chokecherry, and canyon grape consumed during the summer. Additional foods observed being consumed, but not recovered in scats included deer (*Odocoileus virginianus*) carrion; rock squirrels (*Spermophilus variegatus*); flowers of cottonwood (*Populus fremontii*); chokecherry; and agave (*Agave parryii*); wild onions (*Allium* spp.); and orchard fruits, primarily apples.

5.1.3 Food Availability

Fruits

Coatis had some fruits available to them year-round, although the greatest numbers of fruits were available during July-September (Table 5.2, Fig. 5.2). Many of the fruiting species bloomed during April and May, and fruits began ripening during July. During 1996, the spring was so dry that many plants outside of riparian areas lacked enough moisture to complete flowering and/or fruit formation. Consequently, fruit production of manzanita, madrone, and many of the oak species was reduced noticeably over much of the Huachucas. Within drier chaparral habitats, some manzanita and oaks were killed by the drought. No scats containing madrone berries were collected after January 1996, and no scats containing manzanita berries were collected after July 1996. Due to the dry conditions, some plants on the plots failed to produce fruits. Where data on phenology were not attainable, Adams (1988) was consulted.

Riparian deciduous forest had the greatest number of fruit species (juniper, buckthorn, chokecherry, canyon grape, and barberry), followed by encinal and chaparral (juniper, manzanita, oak, and prickly pear) and oak-pine (juniper, oak, madrone).

Invertebrates

Invertebrates were also available to the coatis year-round. Numbers of invertebrates found on all of the plots were low, possibly due to the drought or chance locations of the individual plots. Invertebrate abundance did not differ by season, but differed significantly by plot (ANOVA; F=17.77, d.f.=11, P=0.0007, R^2=0.87), with riparian and oak-pine habitats having significantly greater abundance than chaparral and encinal (Scheffé's test, P<0.05; Fig. 5.4). No clear seasonal pattern was evident for any of the five taxa most commonly found in scats (Fig. 5.3).

Soil moisture varied significantly by plot and season (ANOVA; F=22.01, d.f.=15, P=0.0001, R^2=0.90; Fig. 5.4). Soil temperature also differed significantly among plots and among seasons (ANOVA; F=123.98, d.f.=15, R^2=0.98, P<0.0001), increasing significantly from winter to summer (Scheffé's test, P<0.05).

5.1.4 Habitat Use

Coatis were located most frequently in woodland habitats (Fig. 5.5). Using the Fort Huachuca vegetation layer, average percentages of individual coati locations were highest in oak woodland and riparian forests (Table 5.3). Less than 10% of locations occurred in grassland habitats. Using the GAP vegetation layer, coatis were located most frequently in encinal and ponderosa pine forest (Table 5.4). For both vegetation layers, substantial variability existed in use of particular habitats, among both males and troops (Tables 5.3, 5.4). Coatis were located most frequently between 1600 and 2100 m in elevation (Table 5.5). Significant differences were found among elevations of coati locations for males (Kruskal-Wallis, χ^2=132.71, d.f.=5, P=0.0001) and among troops (χ^2=104.48, d.f.=6, P=0.0001). Proportion of coati locations was slightly higher on north aspects than south aspects (Table 5.6).

5.2 Discussion

5.2.1 Food Habits

The results of this study agree with previous studies that coatis eat primarily fruits and invertebrates, with vertebrates comprising < 10% of the diet (Myers, 1930; Wallmo and Gallizioli, 1954; Kaufmann, 1962; Pratt, 1962; Risser, 1963; Smythe, 1970; Kaufmann et al., 1976; Russell, 1982; Bisbal, 1986; Delibes et al., 1989; Gompper, 1996). Gilbert (1973), in "ripping apart hundreds of scats..." (p. 160), found remains of squirrels, skunks, mice, pack rats, snakes, lizards, and invertebrates, seeds, and vegetable matter. However, he did not state how he differentiated coati scat from gray fox scat, something that other researchers have had difficulty with (e.g., Wallmo and Gallizioli, 1954; this study). In Arizona, coatis occasionally raid orchards and chicken coops, but overall, reports are infrequent (Pratt, 1962; Wallmo and Gallizioli, 1954). Coatis appear to be very opportunistic feeders, consuming foods when they are most available.

5.2.2 Food Availability

This study found seasonal and habitat differences in fruit and invertebrate availability to the coatis. Although some fruits and invertebrates were available year-round, abundance of both peaked during the summer. Previous studies have found that arthropod abundance is correlated positively with rainfall or soil and leaf litter moisture (Janzen and Schoener, 1967; Dunham, 1978; Levings and Windsor, 1982; Tanaka and Tanaka, 1982). Other studies in the tropics found that rainfall increased arthropod mortality, resulting in a decline in abundance during the rainy season (Buskirk and Buskirk, 1976; Sanjayan et al., 1995). For leaf-litter invertebrates, litter moisture was related significantly to invertebrate abundance, among habitats (Janzen and Schoener, 1967) and among seasons (Levings and Windsor, 1982). In this study, higher invertebrate abundance was found in wetter habitats. Lack of significant differences among seasons in this study may have been a sampling artifact.

In Panama, where coatis have been studied in detail, large fleshy fruits make up the majority of the diet (Kaufmann, 1962; Smythe, 1970; Russell, 1982; Gompper, 1996). Production of these fruits varies seasonally and affects coati reproduction, troop size, and movement patterns (Smythe, 1970; Russell, 1982; Gompper, 1996). Young coatis in Panama begin foraging on solid foods as soon as they leave the parturition dens at around 5 weeks of age (Russell, 1982). It appears that, like in Panama (Smythe, 1970; Russell, 1982), reproduction of coatis in Arizona is timed to the period of maximum food availability for young coatis.

5.2.3 Habitat use

Previous researchers in Arizona have recognized the coati's affinity for woodland habitats. Wallmo and Gallizioli (1954) recorded 72% of coati observations in riparian deciduous habitat and oak-pine woodland in the Huachucas. In the Chiricahuas, Lanning (1975, 1976) found coatis often on brushy canyon slopes and described their habitat as evergreen woodland between 1400 and 2000 m, with the greatest number of observations between 1400 and 1500 m. Kaufmann et al. (1976) summarized coati habitat as primarily encinal and pine-oak woodland, with occasional sightings in montane conifer forest, riparian deciduous forest and Sonoran desertscrub. This study concurs with previous observations, except that coatis were most frequently located at higher elevations than in the Chiracahuas.

Even within woodland habitat, variability was high among troops and among males in habitat use. Most of this was likely due to differences in elevation. This variability in habitat use should be taken into consideration when planning habitat selection studies.

All trapping, except for a few trap-days along the San Pedro River, were conducted in canyons at 1400-1850 m elevation. Resident coatis also are known to inhabit cottonwood-lined watercourses, often at some distance from encinal or pine-oak associations, such as Upper Cienega Creek (pers. obs.) and Aravaipa Creek (Nature Conservancy brochure). Studies of food habits and movements of these coatis are needed. In addition, more than a dozen coatis have been seen over the years at Organ Pipe National Monument (Kaufmann et al., 1976).

• Table 5.1. Items found in 92 coati scats, by percent occurrence. Huachuca Mountains, January 1996-April 1997.

Taxa		Winter N=30	Spring N=19	Summer N=27	Fall N=16	Total N=92
Fruits	**Juniper**					
(92.4%)	*Juniperus deppeana*	100%	47.4%	66.7%	100%	79.4%
	Manzanita					
	Arctostaphylos pungens	10.0%	42.1%	11.1%	0%	15.2%
	Buckthorn					
	Rhamnus betulaefolia	0%	0%	14.8%	0%	4.4%
	Chokecherry					
	Prunus virginiana	0%	0%	14.8%	0%	4.4%
	Prickly Pear					
	Opuntia spp.	0%	0%	11.1%	0%	3.3%
	Oak					
	Quercus spp.	3.3%	0%	3.7%	0%	2.2%
	Madrone					
	Arbutus arizonica	3.3%	0%	0%	6.3%	2.2%
	Canyon Grape					
	Vitis arizonica	0%	0%	3.7%	0%	1.1%
	Barberry					
	Berberis wilcoxii	0%	5.3%	0%	0%	1.1%
	Unidentified	10.0%	0%	0%	0%	3.3%
Invertebrates	**Coleoptera**	53.5%	31.6%	70.4%	56.3%	54.4%
(77.2%)	**Lepidoptera**	30.0%	68.4%	18.5%	6.3%	30.4%
	Orthoptera	16.7%	31.6%	22.2%	12.5%	20.7%
	Gastropoda	20.0%	5.3%	22.2%	6.3%	15.2%
	Chilopoda	20.0%	5.3%	18.5%	16.3%	14.1%
	Hymenoptera	10.0%	15.8%	3.7%	6.3%	8.7%
	Araneae	10.0%	5.3%	0%	0%	4.4%
	Homoptera	3.3%	0%	3.7%	6.3%	3.3%
	Diptera	3.3%	5.3%	3.7%	0%	3.3%
	Oligochaeta	0%	0%	0%	6.3%	1.1%
	Scorpiones	0%	5.3%	0%	0%	1.1%
	Odonata	0%	0%	3.7%	0%	1.1%
	Unidentified	13.3%	5.3%	3.7%	6.3%	7.6%
Vertebrates	**Reptiles**					
(4.3%)	*Sceloporus* spp.	3.3%	0%	0%	6.3%	2.2%
	Birds					
	Passeriformes	3.3%	0%	0%	0%	1.1%
	Mammals					
	Sylvilagus spp.	0%	0%	0%	6.3%	1.1%

• Table 5.2. Approximate flowering and fruiting times for plants on Fort Huachuca whose fruits were found in coati scats, January 1996-April 1997. Fruiting period means the period when ripe fruit is available to coatis; fruit may be on the trees or on the ground.

Species	Flowering Period	Fruiting Period
Alligator juniper	March-April	Year-round
Buckthorn	May	July-October
Prickly Pear	April-May	August-October
Manzanita	March-April	July-March
Chokecherry	May	August-September
Canyon Grape	May	August-October
Oak spp.	April-May	August-January
Barberry	March-April	July-October
Madrone	April-May	October-January

• Table 5.3. Proportion of habitat types from the Fort Huachuca vegetation layer within 20 m circles around independent coati locations, March 1996-April 1997. N equals the number of individuals/troops with locations in that habitat type. Coatis with home ranges entirely outside Fort Huachuca excluded from analyses. Total = total percent composition for all males or females combined. Unclassified = locations outside the Fort boundary.

	Males			Females		
Vegetation type	**N**	**Total %**	**Range (%)**	**N**	**Total %**	**Range (%)**
Open grassland	0	0		0	0	
Shrub grassland	0	0		0	0	
Mesquite grassland	1	0.9		1	1.7	
Shrubland	0	0		0	0	
Mesquite woodland	0	0		0	0	
Oak-grass savanna	2	1.2	0-5	3	8.11	0-32
Oak woodland	5	25.3	21-44	5	37.2	23-61
Mixed woodland	5	12.1	2-24	3	9.58	0-20
Pine woodland	3	1.9	0-5	0		
Riparian woodland	5	23.5	2-87	5	18.1	11-37
Mahogany woodland	1	5.0		1	10.0	
Pinyon-Juniper woodland	0	0		0	0	
Urban and built up land	1	4.17		0	0	
Unclassified	4	25.9	0-45	4	15.3	0-53

• Table 5.4. Proportion of habitat types from the Arizona GAP analyses vegetation layer at independent coati locations, March 1996-April 1997. N equals the number of individuals/troops with locations in that habitat type. Total = total percent composition for all males or females combined.

	Males			Females		
Vegetation type	**N**	**Total %**	**Range (%)**	**N**	**Total %**	**Range (%)**
Encinal mixed oak	2	22.1	0-60	4	5.4	0-21
Encinal mixed oak-pine	6	54.0	28-79	7	63.2	47-86
Encinal pinyon-juniper	0	0		0	0	
Great Basin riparian	2	4.3	2-31	4	3.0	0-13
Interior riparian	2	2.1	0-7	2	2.0	0-13
Ponderosa pine	6	22.1	4-62	6	26.1	0-47
Mixed grass-mesquite	0	0		0	0	
Mixed grass-scrub	0	0		1	0.3	
Mixed grass-yucca-agave	1	0.4		0	0	
Urban	1	3.4	0-32	0	0	

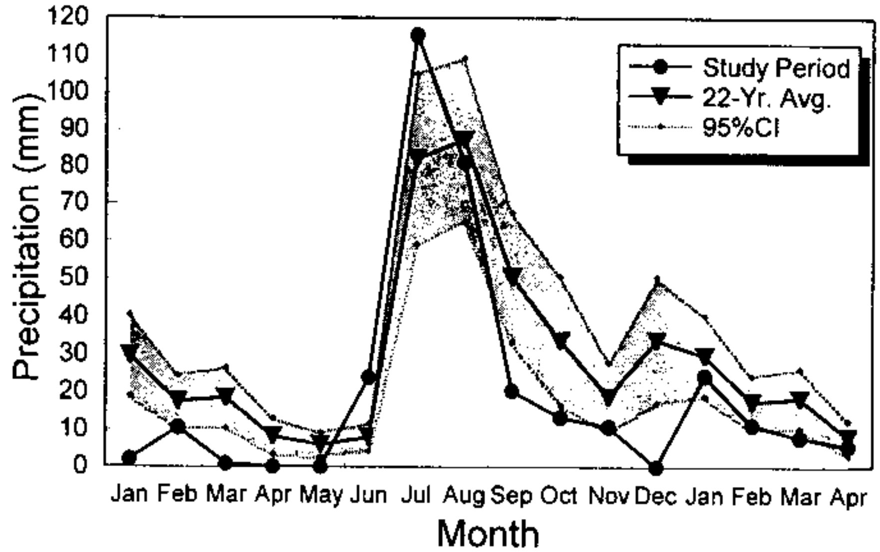
• Table 5.5. Proportion of coati locations at different elevation classes, March 1996-April 1997. N equals the number of individuals/troops with locations in that habitat type. Total = total percent composition for all males or females combined.

	Males			Females		
Elevation	**N**	**Total %**	**Range (%)**	**N**	**Total %**	**Range (%)**
1400-1499	1	0.9		0	0	
1500-1599	3	7.7	0-36	4	3.5	0-18
1600-1699	4	21.7	0-64	6	14.7	0-38
1700-1799	6	19.2	2-45	7	20.4	10-40
1800-1899	6	18.7	6-29	7	23.9	10-28
1900-1999	5	14.0	0-29	6	22.6	0-43
2000-2099	5	11.5	0-36	5	8.7	0-26
2100-2199	3	4.7	0-12	3	3.5	0-6
2200-2299	2	0.9	0-3	1	0.3	
2300-2399	1	0.4		2	1.0	0-10
2400-2499	1	0.4		0	0	
2500-2599	0	0		1	1.5	

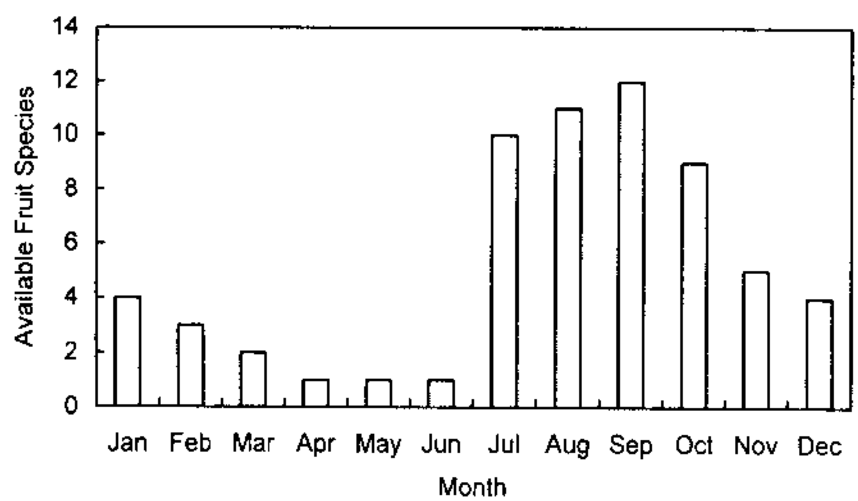
• Table 5.6. Proportion of independent coati locations at different aspects, March 1996-April 1997. N equals the number of individuals/troops with locations in that habitat type. Total = total percent composition for all males or females combined.

	Males			Females		
Aspect	**N**	**Total %**	**Range (%)**	**N**	**Total %**	**Range (%)**
E	6	20.0	14-26	7	12.9	3-25
N	6	18.3	12-30	7	21.9	8-40
NE	6	14.9	7-28	6	19.2	0-26
NW	6	16.6	6-26	7	15.7	8-38
S	6	7.7	4-14	6	6.5	0-10
SE	6	14.5	6-26	7	11.9	5-29
SW	3	4.3	0-13	4	4.2	0-10
W	5	3.8	0-6	5	7.7	0-17

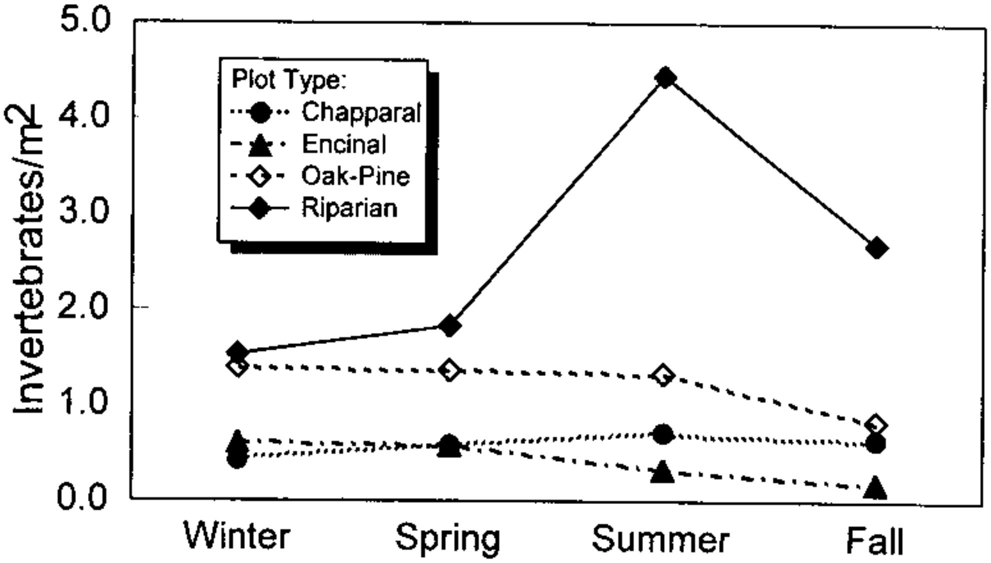
• Figure 5.1. Precipitation during the study period (January 1996-April 1997), Central Meteorological Observatory, Fort Huachuca.

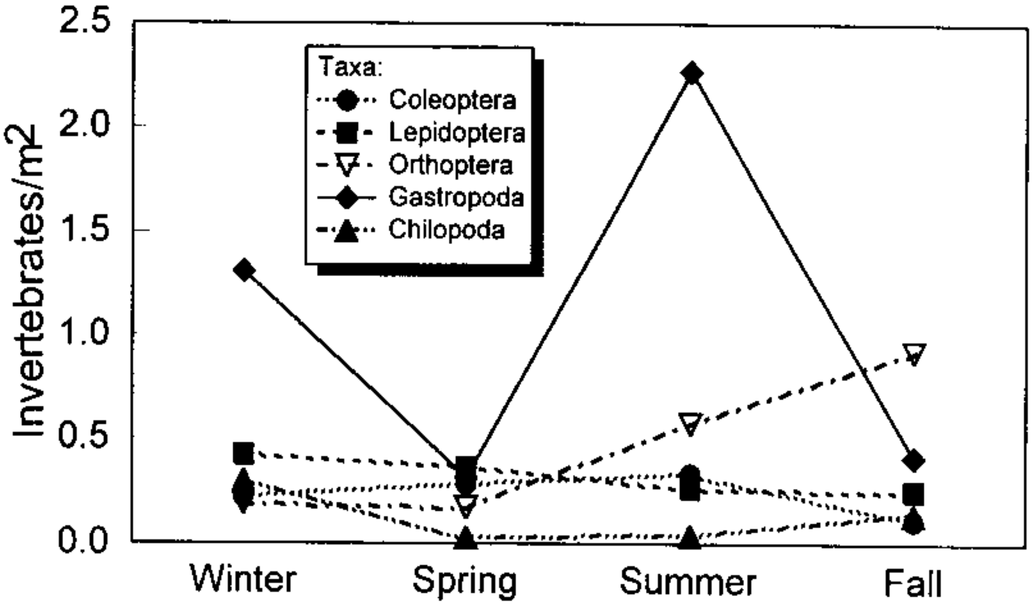


• Figure 5.2. Number of different species of fruit available to coatis in the Huachuca Mountains. Includes fruit species found in scats and three probable foods, buckbrush (*Ceanothus fendleri*), silktassel (*Garrya wrightii*) and raspberry (*Rubus neomexicanus*).

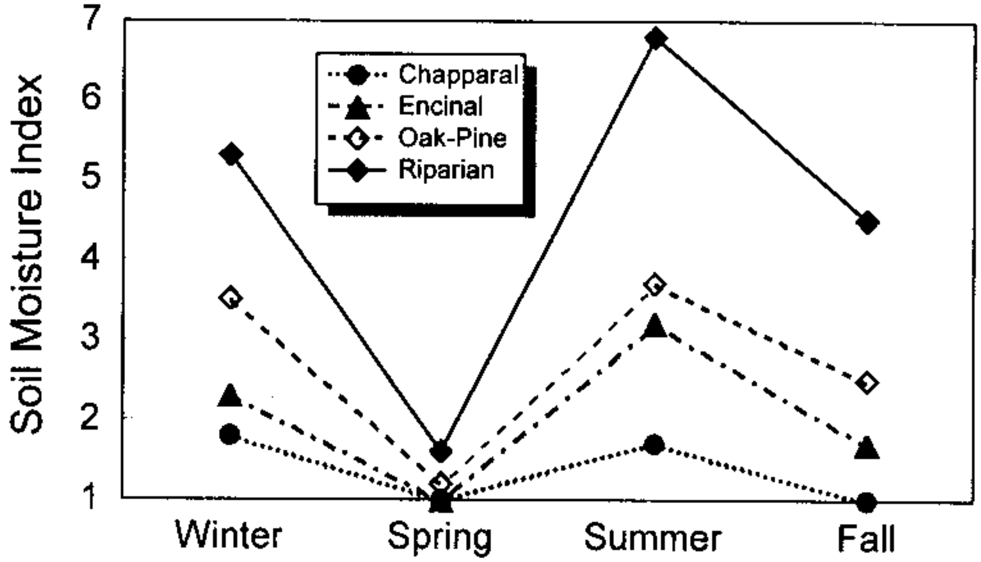


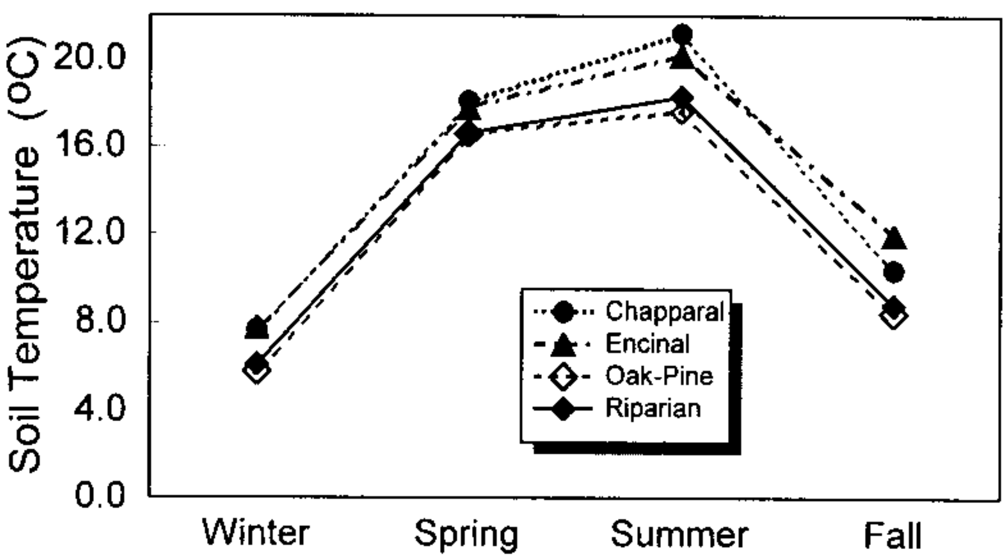
• Figure 5.4. Abundance of invertebrates at plots on Fort Huachuca, March 1996-February 1997.

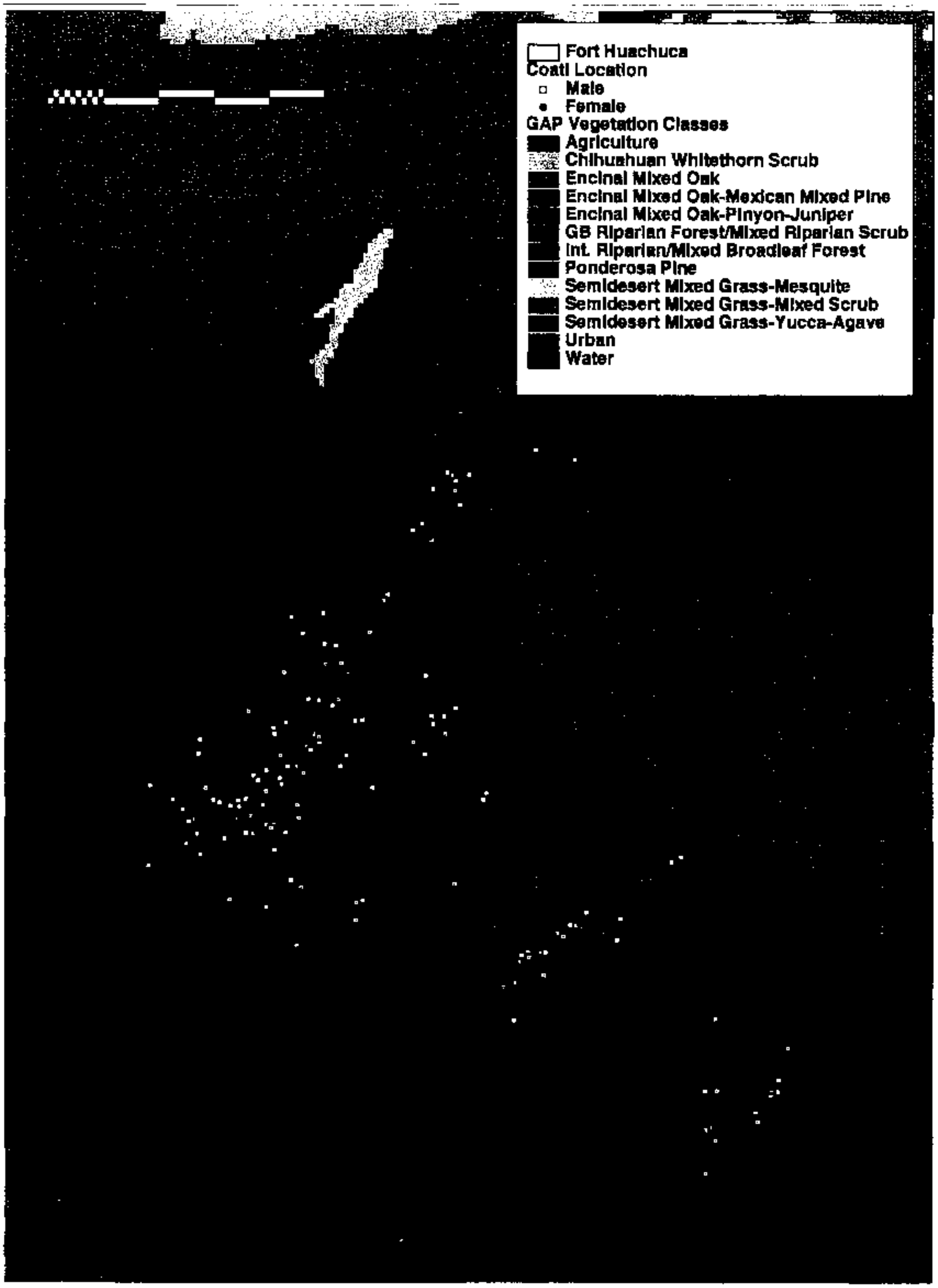




• Figure 5.5. Soil moisture and temperature at plots at Fort Huachuca, March 1996-February 1997. Moisture index ranged from 1 to 7, with 1 indicating dry soil and 7 indicating saturated soil.







• Figure 5.6. Vegetation classification according to Arizona GAP analysis, along with male and female coati locations. Huachuca Mountains, January 1996-April 1997. Serially correlated locations excluded.

Chapter 6

6 Problem Coatis and Management Recommendations

6.1 Problem Coatis

During the study, three male coatis were identified that would approach people for handouts. Two of these, one in Ramsey Canyon (M86) and one in lower Huachuca Canyon (M37) moved into residential areas and became quite aggressive at obtaining food. During mid-June 1996, Ramsey Canyon Preserve asked us to move M86. He was raiding hummingbird feeders, entering cabins on the Preserve and absconding with visitor's groceries. Following consultation with the local AGFD Wildlife Manager, he was released in Bear Canyon on the west side of the Huachucas.

M37 frequently was located in the housing area in lower Huachuca Canyon during spring 1996. He reportedly helped himself to pet food and water left outside. Some residents admitted putting out food and water for him, and members of the Military Police were observed putting food out behind the police station. One resident reported that the coati entered her home, and when she tried to shoo him out, he growled and cornered her in a small room in her house. Some days later, he reportedly stalked a house cat sleeping in a easy chair on it's owners porch. He jumped onto the chair and wrestled with the cat, scaring some nearby children, but not harming the cat. Repeated attempts to relocate the coati into Garden and Blacktail Canyons failed; he returned each time in < 24 h. After M37 dug up the General's garden, he was relocated off Post and released in Bear Canyon. His radio-collar was removed at this time, but a small colored eartag was attached to his right ear.

The Wildlife Office received occasional reports of solitary coatis in the housing area, but no one observed an eartag on any of the animals. M37 was caught in a trap in lower Huachuca Canyon during October 1996. His eartag was present, but faded and hardly noticeable. It is unknown how long he had been back in Huachuca Canyon. He was radio-collared again during March 1997, and although observed frequently in the housing area, the Wildlife Office received no complaints. He occupied the same home range he had during the previous spring. M37 was killed by a mountain lion during June 1997.

M86 was recaptured in Ramsey Canyon during December 1996. He had lost his colored eartag, but was identifiable by scars and extraordinary size. He was radio-collared at this time. As with M37, he remained in his former home range. Other than occasionally scratching on cabin doors on the Preserve, he appeared to be staying out of trouble. M86 disappeared at the end of April 1997.

Although M14 readily approached cars at the picnic areas in Garden Canyon, apparently looking for handouts, he never ventured into any housing areas. Other than defending himself vigorously against an attack by a hundred-pound (45 kg) Labrador Retriever, he appeared to cause no problems, and it was never deemed necessary to attempt to relocate him. M14 died of unknown etiology during November 1996.

As with bears, the presence of people in or near woodland habitat may bring coatis into contact with people. Coatis, particularly males, readily habituate to people if it means easy access to food. As with bears, habituation to people means coatis may get more aggressive and ingenious in attempts to get food. Relocating coatis, at least within the same mountain range, may not be a useful strategy, depending on how the results of this study's relocation efforts are interpreted. Perhaps the best strategy for reducing nuisance coatis is to eliminate artificial food sources and educate people about the hazards of feeding wildlife.

6.2 Management Recommendations

If taxidermist mounts account for the majority of coatis hunted in the state of Arizona, then current harvest levels are unlikely to have much impact on coati populations. However, the Arizona Game & Fish Department is losing data by not requiring hunters to report coatis harvested. Information on coati distribution and relative abundance (especially in outlying areas) is being lost. While hunter reports are unlikely to be a suitable numeric census technique for coatis, for reasons mentioned above, reports could provide useful information on possible changes in year-to-year distribution and relative abundance. Additional data on coati age, sex, health, and population genetics could be obtained if hunters were required to submit coatis for sampling.

Coatis were frequently located in riparian habitats. Both invertebrates and fruits were most abundant in this habitat, and it is possible that riparian areas are critical for the survival of coatis, and other members of the fruit-and-bug eating guild that occupies the sky islands of southeastern Arizona. These habitats may need to be protected if maintaining or increasing populations of coatis becomes a management goal. First, however, more studies on statewide distribution and habitat use are needed.

Chapter 7

7 Conclusions

This study quantified a number of aspects of coati ecology that had not been quantified before, particularly in Arizona. Coatis in Arizona exist at much lower densities than in the tropics, due to larger home range sizes and higher mortality rates. Water appeared to be a limiting factor, as food was more abundant in moister habitats and at wetter times of the year. The high degree of sociality, home range overlap, and occasional contact among neighboring troops make coatis very vulnerable to contagious diseases.

It cannot be emphasized enough that this was short-term preliminary study, and results may differ from subsequent studies or studies in other areas. Food habits, home range size, movement patterns, group dynamics, reproduction, and mortality may all be different in wetter years. Further studies of coatis in the Huachucas, surrounding mountain ranges, as well as resident troops in lower riparian areas are needed. The high mortality rates and low densities make acquiring sufficient samples sizes difficult for studies of habitat selection, sexual differences in diet, habitat use, etc.

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